

PRIOR KNOWLEDGE: Write the rules for factoring
Difference of Two Squares:
Sum and Difference of Cubes:
Problems 1 – 16, Find each of the following limits analytically. Show your algebraic analysis.

1. $\lim_{x \rightarrow 3} \left(\frac{2}{3}x^2 + 3x \right)$

2. $\lim_{t \rightarrow 4} \frac{t-4}{t^2-16}$

3. $\lim_{x \rightarrow -3} \frac{x^2-5x+6}{2x+6}$

4. $\lim_{\theta \rightarrow \pi} \sin^2 \theta - 3 \cos \theta$

5. $\lim_{x \rightarrow 2} \frac{x^3-8}{x-2}$

6. $\lim_{\theta \rightarrow \frac{\pi}{3}} \frac{\tan \theta}{\theta^2}$

<p>7. $\lim_{x \rightarrow 0} \frac{\sqrt{x+5} - \sqrt{5}}{x}$</p>	<p>8. $\lim_{x \rightarrow 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x}$</p>
<p>9. $\lim_{x \rightarrow e} \frac{3x}{\ln x}$</p>	<p>10. $\lim_{x \rightarrow 2^+} \frac{3x^2 + 7x + 2}{x^2 - 4}$</p>
<p>11. $\lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3}$</p>	<p>12. $\lim_{x \rightarrow \frac{3}{2}} \frac{8x^3 - 27}{2x - 3}$</p>
<p>13. $\lim_{x \rightarrow \pi^+} \cot x$</p>	<p>14. $\lim_{x \rightarrow 0} \cos(x + \sin x)$</p>

15. $f(x) = \begin{cases} 3x - 1, & x \leq 1 \\ 3x^2, & x > 1 \end{cases}$, find $\lim_{x \rightarrow 1} f(x)$	16. $\lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$
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Problems 17 – 32, find the limits, if they exist, for the given piecewise-defined functions.

$$f(x) = \begin{cases} x + 3, & x < 2 \\ x^2 - 1, & 2 \leq x < 4 \\ \sqrt{x + 5}, & x \geq 4 \end{cases}$$

$$g(x) = \begin{cases} 4 - x^2, & x \leq 1 \\ 7, & 1 < x < 3 \\ 2 - x, & x \geq 3 \end{cases}$$

17. $\lim_{x \rightarrow 2^+} f(x)$	18. $\lim_{x \rightarrow 2^-} f(x)$	19. $\lim_{x \rightarrow 2} f(x)$	20. $f(2)$
21. $\lim_{x \rightarrow 4^+} f(x)$	22. $\lim_{x \rightarrow 4^-} f(x)$	23. $\lim_{x \rightarrow 4} f(x)$	24. $f(4)$
25. $\lim_{x \rightarrow 1^-} g(x)$	26. $\lim_{x \rightarrow 1^+} g(x)$	27. $\lim_{x \rightarrow 1} g(x)$	28. $g(1)$
29. $\lim_{x \rightarrow 3^-} g(x)$	30. $\lim_{x \rightarrow 3^+} g(x)$	31. $\lim_{x \rightarrow 3} g(x)$	32. $g(3)$